Formulas sheet :

$$z = x + iy$$

$$z = r(\cos\theta + i\sin\theta)$$

$$z^n = |z|^n e^{ni\theta}$$
$$= |z|^n(\cos n\theta + i\sin n\theta)$$

$$a_n\frac{d^n y}{dx^n} + a_{n-1}\frac{d^{n-1}y}{dx^{n-1}} + \cdots + a_0 y = g(x)$$

$$\frac{dy}{dx} + P(x)y = f(x)$$

$$e^{\int P(x)dx}$$

$$M(x,y)dx + N(x,y)dy = 0$$

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$$

$$f(x,y) = \int M(x,y)dx + g(y)$$

$$\mu(x) = exp\int\left[\frac{\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}}{Q(x,y)}\right]dx$$

$$y = ux\ , \quad or\ , \quad u = y^{1-n}\ ,$$

$$or\ ,\ u = Ax + By + C$$

$$W(f_1, f_2, \ldots, f_n) = \begin{vmatrix} f_1 & \cdots & f_n \\ \vdots & \ddots & \vdots \\ {f_1}^{(n-1)} & \cdots & {f_n}^{(n-1)} \end{vmatrix}$$

$$y = c_1y_1(x) + c_2y_2(x) + \cdots + c_ky_k(x)$$

$$y = y_c + y_p$$

$$y \equiv e^{mx}$$

$$3\ cases: \begin{cases} m - -y = c1e^{mx} + c2xe^{mx} \\ m1, m2\ real - y = c1e^{m1x} + c2e^{m2x} \\ m1, m2\ comp - y = e^{\alpha x}(c1\cos(\beta x) + c2\sin(\beta x)) \end{cases}$$

TABLE 3.4.1 Trial Particular Solutions

$g(x)$	Form of y_p
1. 1 (any constant)	A
2. $5x + 7$	$Ax + B$
3. $3x^2 - 2$	$Ax^2 + Bx + C$
4. $x^3 - x + 1$	$Ax^3 + Bx^2 + Cx + E$
5. $\sin 4x$	$A\cos 4x + B\sin 4x$
6. $\cos 4x$	$A\cos 4x + B\sin 4x$
7. e^{5x}	Ae^{5x}
8. $(9x - 2)e^{5x}$	$(Ax + B)e^{5x}$
9. x^2e^{5x}	$(Ax^2 + Bx + C)e^{5x}$
10. $e^{3x}\sin 4x$	$Ae^{3x}\cos 4x + Be^{3x}\sin 4x$
11. $5x^2\sin 4x$	$(Ax^2 + Bx + C)\cos 4x + (Ex^2 + Fx + G)\sin 4x$
12. $xe^{3x}\cos 4x$	$(Ax + B)e^{3x}\cos 4x + (Cx + E)e^{3x}\sin 4x$

$$y_p = uy_1 + vy_2$$

$$u = -\int\frac{y_2 f(x)}{W}dx\ , \qquad v = \int\frac{y_1 f(x)}{W}dx$$

$$y \equiv x^m$$

$$3\ cases: \begin{cases} m \quad y = (c1 + c2\ln(x))x^m \\ m1, m2\ real \quad y = c1x^{m1} + c2x^{m2} \\ m1, m2\ \in \mathbb{C}\ \ y = x^{\mu}(c1\cos(\nu\ln(x)) + c2\sin(\nu\ln(x))) \end{cases}$$

$$y \equiv \sum_{n=0}^{\infty} a_n x^n$$

$$\det(A - \lambda I) = 0$$

$$X = Ke^{\lambda t}$$